

Shaan Wrench

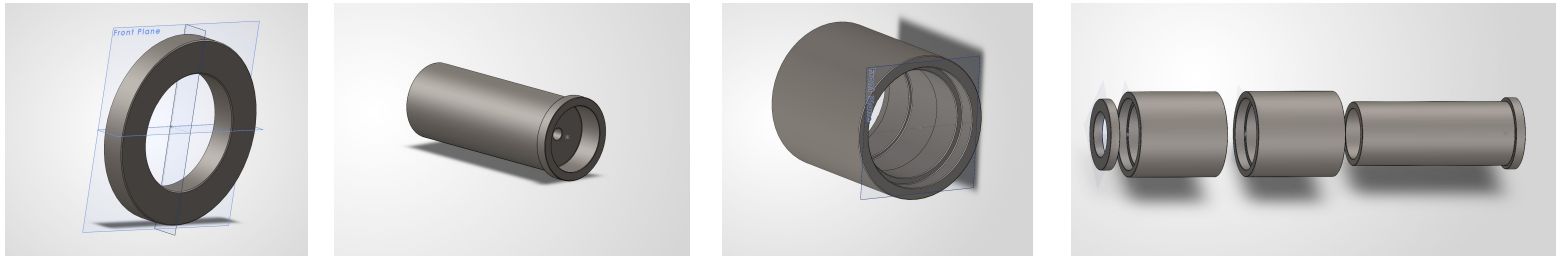
Mechanical Engineering (AI Systems Engineering Option): Western University
CNC • SolidWorks • Manufacturing • Mechanical Design

Manufacturing Engineering Internship - Bemco Machine Works Ltd.

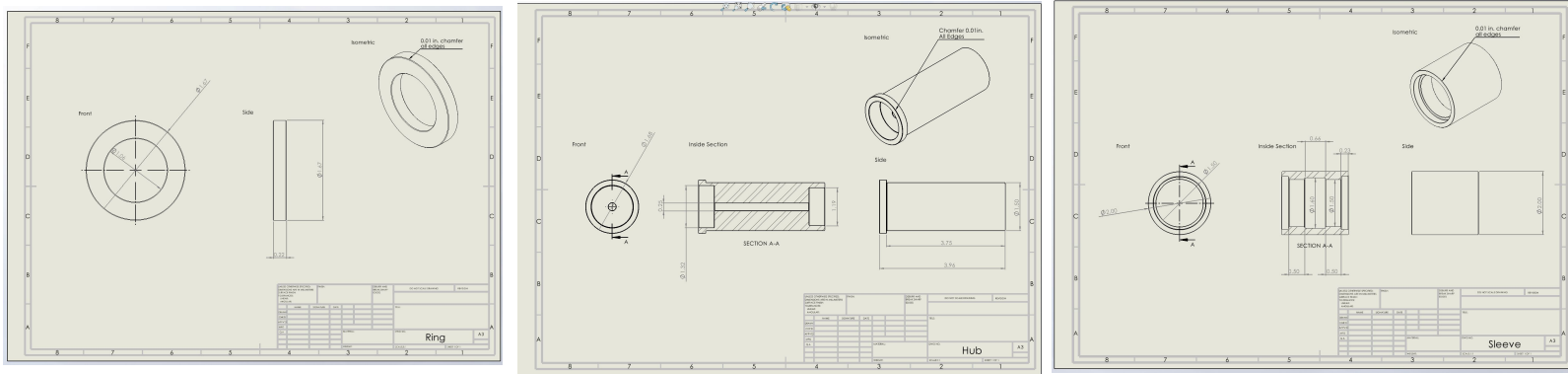
Bemco manufactures rolls for the steel mill industry and originated the sleeved roll design. A solid roll wears out where the impact lands, so Bemco redesigns it as a hub carrying one or two sleeves. A worn sleeve can be reversed to use its unworn side, and the two sleeves can be swapped. Two sleeves with two usable sides each gives four times the service life of a solid roll.

I built scaled training versions of the full two-sleeve assembly. I modelled the hub, sleeves and ring in SolidWorks, produced dimensioned drawings with section views and chamfer callouts, machined the parts on manual and CNC lathes, and assembled them to check fit.

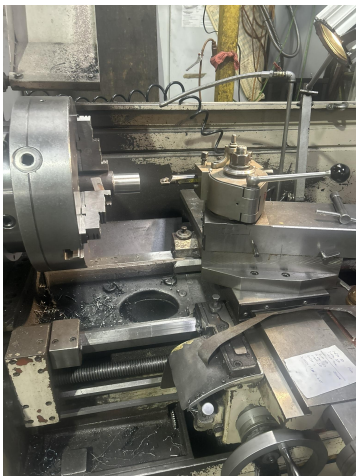
SolidWorks models and exploded assembly



Manufacturing drawings



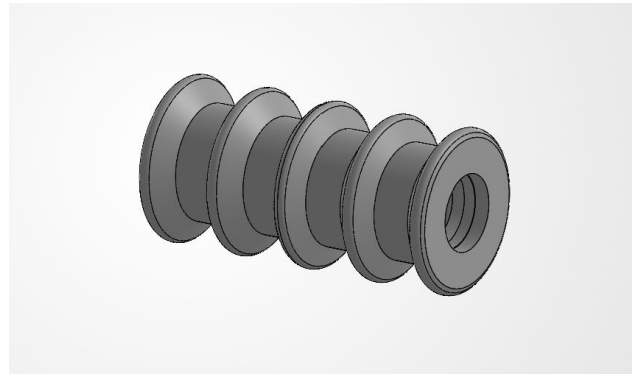
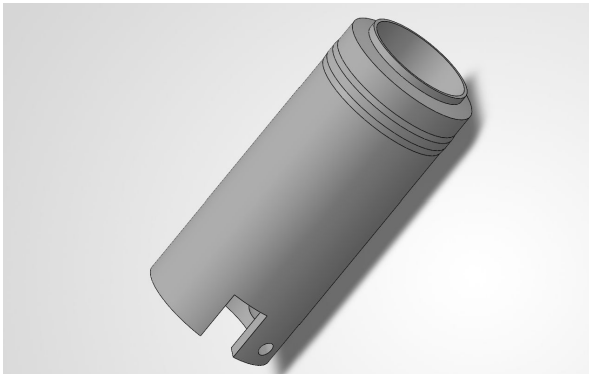
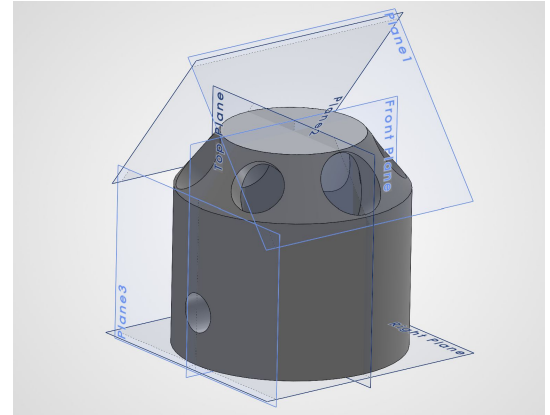
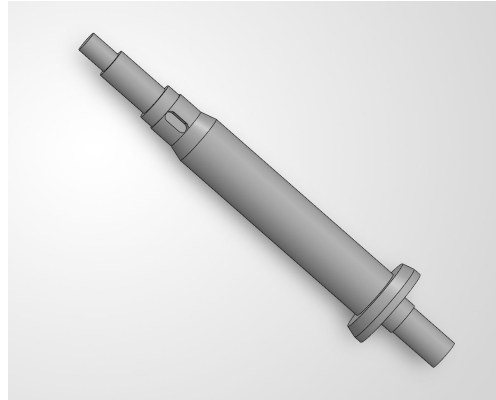
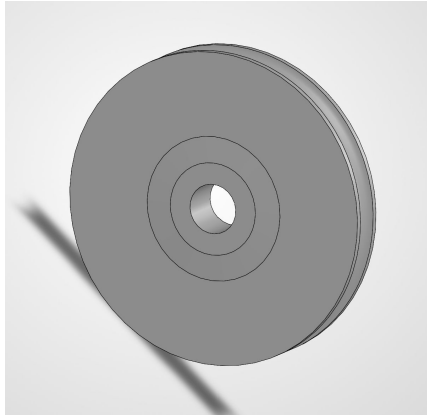
Machined and assembled



Manufacturing Engineering Internship - Bemco Machine Works Ltd.

Reverse Engineering:

These parts I made had no drawings. They were legacy components, and the only record of the geometry was the part itself. I measured them and rebuilt them in SolidWorks including geometry, tolerances and GD&T callouts.



Manufacturing from Drawings:

Working from supplied drawings on manual and CNC lathes: reading the drawing, planning the operation sequence, selecting tooling and speeds and feeds, and inspecting in-process to hold the specified tolerances.



Production Quality Control System - Bemco Machine Works Ltd.

Bemco machines rolls and roll components for the steel mill industry to tight drawing tolerances. Inspection was tracked on paper, where a measurement only got verified if someone remembered to verify it. I designed and built the system that replaced it, now used by six machinists on shop-floor tablets.



The office issues a work order carrying the customer, drawing number, casting count, and the dimensions and tolerances for every operation. On the floor, each casting is screened proceed or not-proceed before any machining time is spent on it. Operators then record actual measurements against each dimension, checked against tolerance as they are entered.

Office

New Work Order

One physical piece. Add each operation next (milling, drilling, etc.) with its own Inspection Report dimensions. They'll all combine into one Q.A. Ship form once every operation is done.

CUSTOMER

Northgate Steel

P.O.#

NS-0044187

DRAWING#

GRS-2140

REV#

3

PRODUCT#

041207G

DESCRIPTION

Guide Roll Sleeve

Is there casting?

☒

HOW MANY PARTS/CASTINGS?

5

Shop Floor

New Operation

One task on this piece — its part count (1) comes from this work order's casting setup. Casting itself is optional and never blocks this — define its Inspection Report dimensions and its ready to go.

Adding as Harry

OPERATION NAME

B - Finishing O.D

DIMENSIONS TO CHECK AT INSPECTION (OPTIONAL — FLOOR CAN ADD MORE)

14.750

+0.000/-0.002

X

22.500

1/32

X

0.750

+0.002/-0.000

X

Surface Finish

Tolerance (e.g. ±0.002)

X

+ Add another dimension

SEND TO SHOP FLOOR NOW

Cancel

Shop Floor

041207G • GRS-2140

Guide Roll Sleeve - Northgate Steel

P.O. NS-0044187 - Drawing GRS-2140 Rev 3 - Op —

✓ Casting 1 - Harry

✓ Casting 2 - Harry

✓ Casting 3 - Harry

✓ Casting 4 - Harry

✓ Casting 5 - Harry

Cast 5 — Harry - Sep 12, 7:32 p.m.

Proceed or Not Proceed — Casting 5

PROCEED

X NOT PROCEED

VISUAL CONCERNS

Optional notes

✓ CASTING DONE — CHOOSE OPERATIONS TO INSPECT

Three controls are enforced rather than encouraged:

Inspector Check. The run stays locked after part one until a second person blindly re-measures it without seeing the operator's readings.

Shop Floor

Heat# — 1st part

07412-1

Measurements — 1st part

14.750

Tolerance: +0.000/-0.002

14.750

/

✓ to tol

22.500

Tolerance: 1/32

22.5

/

✓ to tol

0.750

Tolerance: +0.002/-0.000

0.75

/

✓ to tol

Surface Finish

Tolerance: 0

☒

☒

+ Add dimension

Shop Floor

041207G • GRS-2140

Guide Roll Sleeve - Northgate Steel

P.O. NS-0044187 - Drawing GRS-2140 Rev 3 - Op B - Finishing O.D

Inspector check — 1st part

Hand the tablet to the inspector. Measure the 1st part yourself — the operator's numbers are hidden. Every reading is checked automatically.

You measured this part yourself, so you can't also be the inspector — log out (top right) and have someone else log in to do the 1st part check.

Shop Floor

041207G • GRS-2140

Guide Roll Sleeve - Northgate Steel

P.O. NS-0044187 - Drawing GRS-2140 Rev 3 - Op B - Finishing O.D

Inspector check — 1st part

Hand the tablet to the inspector. Measure the 1st part yourself — the operator's numbers are hidden. Every reading is checked automatically.

14.750

Tolerance: +0.000/-0.002

Operator's reading: hidden

Enter

/

22.500

Tolerance: 1/32

Operator's reading: hidden

Enter

/

0.750

Tolerance: +0.002/-0.000

Operator's reading: hidden

Enter

/

Non-conformance hold. An out-of-tolerance reading stops the operation. The operator must request an office override, which is approved or rejected and recorded.

Shop Floor

Heat# — 2nd part

1412-2

Measurements — 2nd part

14.750

Tolerance: +0.000/-0.002

15

/

Enter

/

22.500

Tolerance: 1/32

22.5

/

Enter

/

0.750

Tolerance: +0.002/-0.000

0.75

/

Enter

/

Surface Finish

Tolerance: 0

☒

☒

Is this correct?

15

A: This is out of tolerance

No, retry

Yes

✓ 1st part in tolerance, Inspector confirmed — remaining parts unlocked.

Finish every part first

Shop Floor

041207G • GRS-2140

Guide Roll Sleeve - Northgate Steel

P.O. NS-0044187 - Drawing GRS-2140 Rev 3 - Op B - Finishing O.D

OUT OF TOLERANCE — Non Conformance Report required

Heat 1412-2, dimension 14.750 measured 15, allowed 14.748-14.75 — operator Gurmukh

Request office override

Shop Floor

041207G • GRS-2140

Guide Roll Sleeve - Northgate Steel

P.O. NS-0044187 - Drawing GRS-2140 Rev 3 - Op —

View Completed Forms

CASTING

✓ Casting Inspection — Done

VIEW / EDIT / PRINT

OPERATIONS ON THIS PIECE

041207G • GRS-2140

Guide Roll Sleeve - Northgate Steel - 5 parts

Heat# 4

STOPPED

Sampling before shipment. The Q.A. ship form opens only once every operation is complete. It randomly selects 10% of parts, minimum one; a failure there escalates the whole lot to 100% inspection. Records are write-once for operators and fully editable and printable by the office, giving a traceable history per part.

Shop Floor

041207G • GRS-2140

Guide Roll Sleeve - Northgate Steel

P.O. NS-0044187 - Drawing GRS-2140 Rev 3 - Op —

Q.A. check by Harry

Q.A. Approved to ship

• 10% of parts checked

• If non-conformance found, inspect 100%

• Include copy of Q.A. Approved to ship with parts

Q.A. sample check — 1 of 5 heat#s (10%, minimum 1)

Re-measure every dimension below for the heat# listed — every reading is checked automatically.

Heat# 5

14.750

B - Finishing O.D - Tolerance: +0.000/-0.002

Enter

/

CASTING Inspection — Done

OPERATIONS ON THIS PIECE

041207G • GRS-2140

0 B - Finishing O.D

Guide Roll Sleeve - Northgate Steel - 5 parts

P.O. NS-0044187 - Sent Sep 12, 7:32 p.m. - Operator: Harry - Inspector: Gurmukh

COMPLETE

Resume operation

041207G • GRS-2140

0 A - Roughing I.D

Guide Roll Sleeve - Northgate Steel - 5 parts

P.O. NS-0044187 - Sent Sep 12, 7:30 p.m. - Operator: Gurmukh - Inspector: Harry

COMPLETE

Resume operation

+ Add operation

FINAL STEP

✓ Q.A. Ship Check — Done

B - FINISHING O.D — INSPECTION REPORT

Guide Roll Sleeve

B - Finishing O.D

CUSTOMER	Northgate Steel	P.O.#	NS-0044187	DRAWING#	GRS-2140	REV#	3
PRODUCT#	041207G	DESCRIPTION	Guide Roll Sleeve	OPERATION	B - Finishing O.D	DATE	Sep 12, 7:32 p.m.
PROGRAM#	1142			MACHINE	Puma 400L		
Measured by		Harry	Gurmukh	Gurmukh	Gurmukh	Gurmukh	
		Sep 12, 11:59 p.m.	Sep 13, 12:02 a.m.	Sep 13, 12:02 a.m.	Sep 13, 12:04 a.m.	Sep 13, 12:04 a.m.	
DIMENSION	TOLERANCE	1ST PART Heat# 3	INSPECTOR	2ND PART Heat# 2	3RD PART Heat# 3	4TH PART Heat# 4	
14.750	+0.000/-0.002	14.750	14.75	14.75	14.75	14.75	
22.500	1/32	22.5	22.5	22.5	22.5	22.5	
0.750	+0.002/-0.000	0.75	0.75	0.75	0.75	0.75	
Surface Finish	0	✓	✓	✓	✓	✓	

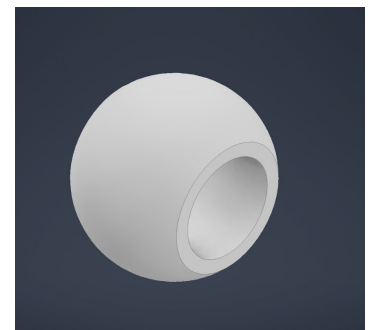
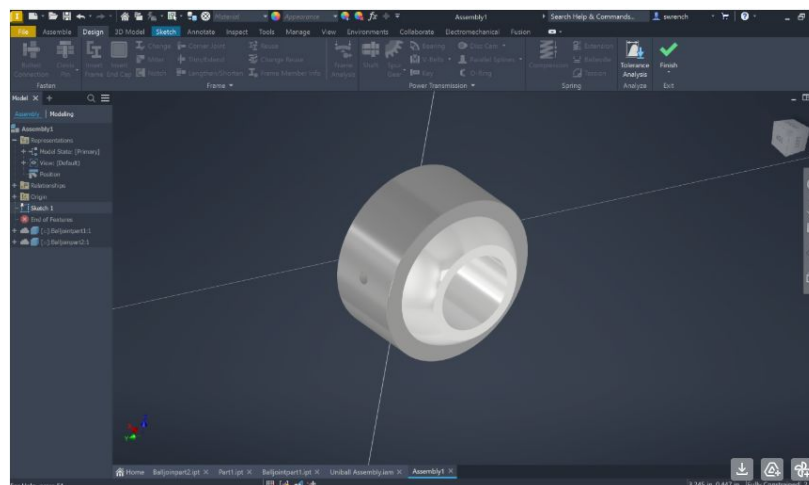
Manufacturing Engineering Internship - Bemco Machine Works Ltd.

Designed and built a retaining wall sized to block falling trees. Base excavation proportioned to wall height, gravel drainage layer to mid-height with drain pipe to relieve hydrostatic pressure, and a setback every two courses to resist overturning.



Mechanical Design: SAE Baja Racing (Front Suspension) - Western University

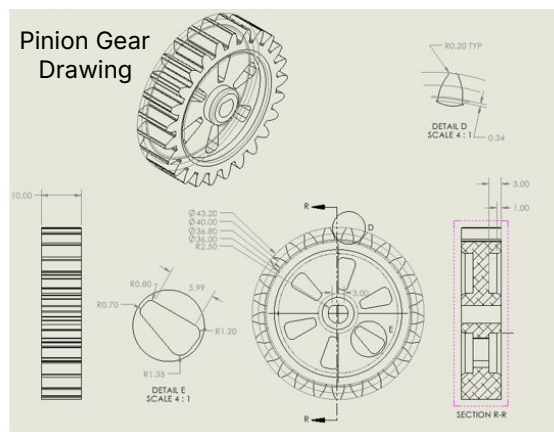
- Modeled a spherical plain bearing (uniball) in Autodesk Inventor based on manufacturer specifications
- Interpreted catalog dimensions and tolerances for accurate fit and articulation
- Designed component for suspension joint allowing multi-axis rotation under dynamic loading
- Integrated bearing geometry into suspension assembly constraints and packaging



Course Project · Western University · Supervised by Dr. Louis Ferreira

- Contributed to early concept generation, including development of Concept 4 (Magnetic Linear Actuator)
- Performed concept evaluation using weighted decision matrices to compare actuation methods
- Assisted in final concept selection based on performance, manufacturability, and constraints
- Produced detailed engineering drawings with tolerances and section views
- Contributed to the design plan and validation strategy for the actuator system

- Designed a linear actuator for an in-vitro shoulder motion simulator
- Required precise multi-axis tendon actuation under dynamic loading
- Design constrained by force (~140 N), mass (<1 kg), accuracy, and compactness
- Evaluated multiple actuation concepts before selecting a rack-and-pinion solution
- Initial concepts included a magnetic linear actuator; the final design selected was a rack-and-pinion mechanism based on feasibility and performance.



First-Year Design Project · Western University

- Conceived the core design concept and led physical prototyping and fabrication
- Built the hail collection system and energy measurement apparatus
- Assembled and tested the full device, contributing to system integration and validation

- Designed and built a portable experimental device to measure hailstone kinetic energy prior to ground impact
- Combined mass measurement and velocity estimation to calculate kinetic energy
- Design emphasized repeatability, portability, and low-cost construction

